State Geographic Information Activities Compendium

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by

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with

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and R. Steven Brown

Center for Environment

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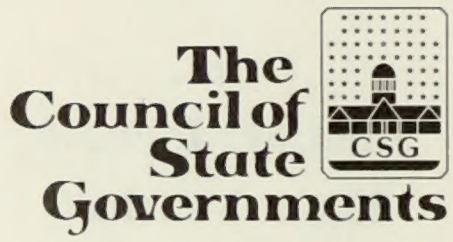

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State Geographic Information Activities Compendium

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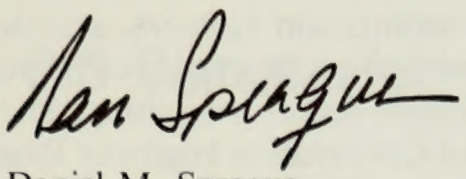
DIRECTORY OF STATE GEOGRAPHIC INFORMATION OFFICIALS

Foreword

The Council of State Governments is pleased to present the first comprehensive compilation of state geographic information activities ever produced. States have been quick to recognize the information management advantages of linking data to location — and the potential for better service to users of that data — and so have greatly expanded their use of geographic information systems (GIS) during recent years. With this expansion, however, comes risks of duplication of effort and inter-agency and intergovernmental coordination problems. This report provides details on the innovative ways states have avoided or overcome these problems, as well as the unique and interesting applications that states have developed using GIS.



Daniel M. Sprague
Executive Director
The Council of State Governments

Corporate Sponsors Acknowledgement

The Council of State Governments is indebted to, and wishes to acknowledge the support of our corporate sponsors who helped make this book possible:

SPOT Image Corporation

Wang Laboratories, Inc.

Acknowledgements

A variety of people and organizations deserve thanks and acknowledgement for their contributions to the *Compendium*. State government officials are among the first to be thanked, particularly our Advisory Board and the 50 state survey coordinators for the project.

Prior to administering the national survey, Governors in each of the states were notified of the project and invited to designate survey coordinators to facilitate the states' responses. The contacts and support provided by the Governors' offices were critical to the success of the *Compendium*. Coordinators and others in each state spent numerous hours on the phone with the authors to ensure accuracy in the profiling process, and to provide as much detail as possible. In total, more than 200 state officials were interviewed for the profiles.

Special thanks are offered to state coordinators who volunteered and helped write state profiles, including Gary Irish, Manager of the Arizona Land Resource Information System; Ted Talmon, GIS Manager of the New Mexico Information Systems Division; Karen Siderelis, Director of the North Carolina Center for Geographic Information and Analysis; and William Holland, Executive Director of the Wisconsin Land Information Board.

Many states also provided information they had gathered from other states to help meet individual state needs. Of special assistance was the contribution of Kathy McCarter, former Indiana GIS Coordinator and now of WOOLPERT Consultants, who participated in the development of the automated survey used to generate the *Compendium's* tables. Also noteworthy were the contributions of Michele Crew, formerly of the New Jersey Department of Environmental Protection, and the efforts of representatives of the University of New Mexico. Early project Coordinators,

no longer in state GIS roles but recognized and thanked for their assistance, include John Hall (Florida), John Finley (Missouri), Jon Sesso (Montana), and Nancy Abraham and Peggy O'Neil (Washington).

Federal agencies also provided assistance for the directory portion of the *Compendium*, including the U.S. Census Bureau, U.S. Geological Survey, National Geodetic Survey, and Federal Highway Administration. The National Park Service and Environmental Protection Agency also provided valuable assistance.

Much assistance was provided by David Boeshaar, who compiled lists gathered from various sources for the *Compendium's* directory, and manipulated thousands of names to develop individualized state lists distributed to each state for verification and updating. Martin Zofcin prepared initial tables from the automated statewide surveys. Sheila Myers assisted in interviewing state officials in Michigan, New Jersey and New York, and preparing state profiles in these states. Terry Jares provided additional assistance in these regards.

Corporate sponsors of the *Compendium* include SPOT Image Corporation and Wang Laboratories, Inc., to whom we are grateful. In addition, we appreciate Ashton-Tate's donation of a copy of dBase IV (TM) software used to develop the automated statewide surveys.

As is often the case in projects such as this, the foundation for study has been set by research and information collection efforts of the past. Over the last decade, informal networks and state-specific inventories of activities have helped to guide the development of GIS in the states. For example, between 1976 and 1984, studies of automated natural resources information systems in the states were conducted by Sally Bay Cornwell, Paul Tessar and Loyola Coron. In the mid-1980s, author Lisa Warnecke, in her work for the states of Colorado and Wyoming, began in earnest her research, inventory and analysis of state geographic information coordination efforts. Other research entities also have conducted important work in the area.

In the "GIS in State Government" section of each State Profile in this *Compendium*, the authors have attempted to describe all state agencies with identified GIS activities (see Guide to Use of the *Compendium*, pp. xi-xii). However, readers should be particularily aware of the conduct of more extensive studies of transportation agencies—historically and currently among the more active users of GIS. In 1990, the Transportation Research Board initiated an analysis of GIS in state transportation agencies, and subsequently began publication of a series of related reports. The most recent report available from the Board is "National Cooperation Highway Research Program," Project 20-27, Research Results Digest, No. 180, August 1991, (202/334-3214). Research on GIS use in state utility regulatory commissions has been conducted by and is available from Automated Mapping/Facilities Management (AM/FM) International (303/337-0513).

One of the more recent efforts to build a national approach to geographic information and geographic information systems came in October 1991, when Georgia Governor Zell Miller invited key officials from across the country to join in a three-day meeting dedicated to state GIS. Common state issues and needs were identified and discussed, and a new "National State Geographic Information Council" was created.

To those individuals and organizations that contributed directly to the completion of this current *Compendium*, to those who lead the way, and to those who will continue the development of GIS efforts in the states, the authors extend their appreciation.

The successful completion of this Compendium *has been tempered by the death of Alan Robinette on January 13, 1992. Mr. Robinette, the first and only director of the Minnesota Land Management Information Center (1977-1992), was a highly respected member of—and leader within—the GIS community. He will long be remembered for his integrity; his technical, managerial and political skills; his dedication to the application of geographic information systems; and his help to others.*

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State of the States: Geographic Information Activities

What do Hernando DeSoto's travels, teenage pregnancy, redistricting, growth management, transportation planning and oil spill prevention have in common? All are state applications of geographic information systems (GIS). State government use of GIS has grown rapidly in recent years. The applications for GIS seem limitless. With growth, however, have come some problems, such as how to coordinate independent GIS activities that might exist at several places within a state.

This section is intended to serve as an Executive Summary and to give the reader a brief look at the state of GIS use in the 50 states, with some conclusions as to the directions states are taking in GIS management and applications.

History

For the most part, state GIS development occurred during the last 10 years. Most state programs have been created within the last four years, and it appears that the advent of improved hardware and software has had a great deal to do with this growth. Prior to 1980, GIS use was largely restricted to specific individual programs, usually natural resource management applications. Access to GIS was generally limited to state employees technically able to experiment with it and use it.

During the late 1980s, however, the range and number of applications grew as technology became easier to use. GIS activities in state governments expanded from one or two agencies to four or more agencies. Plans for GIS applications became more common, even if a good number of them did not get funded. With an expansion of users, whether actual or potential, GIS management has reached a critical point in most states. The primary issue is how geographic information and GIS will be organized and managed in each state.

Organization

One aspect of GIS organization has to do with the amount of centraiized control of information technology and computing in each state. Most states have a central agency responsible for information technology policy, operations or both. Whether this agency issues information policies that other agencies must follow, or instead promotes voluntary interagency cooperation has affected GIS activities across state agencies. The strength and history of GIS in functional agencies such as natural resources and environmental departments are also important factors determining institutional conditions.

The individual state profiles included in this *Compendium* explain the processes that many states are going through to obtain interagency coordination. State coordination groups are being established to encourage collaborative approaches.

Interagency coordination is not limited just to state agencies. Many states are including federal and local agencies and universities in this effort. Some states, like Georgia, Vermont and South Carolina have emphasized regional applications for GIS as part of statewide planning efforts.

The process of organization and coordination is in its infancy and has not yet completed its course. States that are able to tailor the needs of each agency to meet its individual applications, while preserving interagency and intergovernmental transferability of data seem the most likely to succeed.

State funding for GIS applications probably will never be enough for some advocates' expectations, but overall funding for state GIS has fared well, even during fiscal cutbacks. In May 1991, for example, Florida's legislature approved more funding than the Governor had requested for geographic information development. However, 1992 finds nearly all states in fiscal difficulty, and state GIS initiatives will face the toughest challenge of their relatively young existence.

Applications

The wide and growing variety of GIS applications is fascinating. During the preparation of this *Compendium*, the authors and editors were continually amazed by the creativity of state officials in envisioning how GIS could solve their day-to-day and long term problems. The *Compendium's* Applications Index contains over 500 actual or proposed applications for state GIS programs, from "acid rain analysis" to "wildlife tracking."

Many states' GIS applications reflect the early uses of GIS; natural resource, environmental and transportation applications are numerous and are used to meet many diverse needs. However, there are a large number of applications in subject areas not traditional to GIS programs.

Health and social services are functional areas of state government with great potential for new GIS applications. The cognizant state agencies are

faced with a variety of problems involving delivery of services to populations. Isolating the geographical component of these activities seems to be a natural management progression. Many of the GIS applications in these agencies have been formed only recently. Some uses include epidemiological studies, such as cancer incidence (seven states); children and aging programs (six states); even teenage pregnancy (Oregon and Tennessee), labor and employment (Alaska and Washington), and other social service programs (New York).

Growth management and economic development applications capitalize on the ability of GIS to mix demographic, labor and industrial siting data with other geographic information. Growth management legislation has been a primary driver for GIS in some states, providing funding and regional and local connectivity. At least five states used GIS in preparing their Supercollider proposals. Texas, the state that ultimately got the award, is now using it for site analysis and preparation. Siting for manufacturing plants and controversial facilities such as utilities and waste disposal plants is widespread (26 states). The most common use of GIS in facility siting is for waste facilities. Some states also use GIS to look at the impact development might have on other resources (Illinois and Pennsylvania), or ways to develop commercial potential for their state's resources (Mississippi and Washington). Other states have focused on using GIS to support economic development for local governments or rural areas (Alabama, Georgia and Mississippi). South Carolina's economic development agency is unique in its use of GIS as a platform for many of its programs.

In agriculture, GIS applications typically focus on production concerns or the impacts of agricultural practices. For example, six states have GIS applications that investigate pesticide use, while seven midwestern and western states use GIS to address irrigation issues. Soils information is a key component of state GIS. Some examples of its use include measuring erosion potential (six states), wetlands determination (two states), even radon-containing potential (Indiana).

At least 18 states have used historical and cultural information with GIS. These data generally are used for locating archaeological sites for impact assessments, but have other purposes as well. In at least seven states, some historic site data is available using GIS.

Education applications may be another growth area for GIS programs. Already, at least 10 states are using GIS for education programs, in applications such as enrollments, district boundaries, fiscal allocations to districts, transportation, and school lunch programs.

Revenue agencies have developed or are considering GIS applications. Assessments for property taxes are the most frequent use (seven states), but states also have used GIS for license plate renewals (Mississippi) and determining the extent of unmined minerals for taxation purposes (Kentucky).

Another frequent use of GIS is in emergency preparedness programs (21 states), with both natural and man-made disasters included in these efforts. For example, GIS has been used to support emergency management needs such as Hurricane Hugo and the Exxon Valdez crises mitigation. Seven states use GIS to record the location and movements of oil spills. Uses for natural events include earthquake and fire preparedness. Applications for planning responses to man-made emergencies include: military emergencies (New Jersey), nerve gas disposal evacuations (Utah), toxic release impact planning (New York), and chemical munitions transport (Alabama).

States also use GIS for energy applications, most often for alternative sources like biomass (Iowa), co-generation (Washington), hydroelectric and geothermal (Idaho, Washington), and solar and wind (Washington). Oil-producing states like Louisiana and Oklahoma use GIS to monitor oil production.

One of the most common applications to GIS is for transportation. Virtually all state transportation and highway departments are using computer aided design or computer aided mapping and are quickly applying analytical capabilities in GIS software. By far the most common application is for highway mapping, but at least seven other applications can be found in at least five states: accident locations information, bridge management, networks and networks management, pavement management, pipelines information, general planning, and traffic volumes management. A few states also use GIS for applications like nautical charts, school bus routing, hazardous materials routing, railroads, and highway landscaping, among others.

However, the oldest and most common GIS applications are in environmental and natural resource management. The use of GIS in agencies dealing with these subjects is pervasive, but new applications, particularly for information flow management, continue to arise. For example, at least two states use GIS as a tool to model the effects of pending environmental policy decisions (Georgia, South Carolina). Both Kentucky and New Jersey have identified GIS as a way to communicate technical environmental information to a non-technical audience. At least six states use GIS as a tool to help assure communication among the various media control divisions of their

environmental agencies; another six use GIS for locating facilities receiving environmental permits. Other general applications include risk management, modeling, monitoring, and enforcement.

Applications for GIS in natural resource management and in each of the environmental media—air, water and land—is common. For natural resources, forestry, geologic and land management applications are the most prevalent.

GIS is used for both production and environmental impact needs in forestry management and can be found in at least 27 states. Some production applications include inventories (New Mexico), marketing (Washington), and timber stand management (Montana, Washington and Wyoming). Four states address fire fighting and smoke management concerns via GIS. Washington uses GIS for a general assessment of the environmental impacts of forest management.

At least 31 states use GIS for their geologic resource management needs, especially the minerals industry (coal, eight states, and oil and gas, 10 states).

States are likely to use GIS for general land management purposes. For example, 20 states are beginning to use it for the management of state-owned lands. A related, potentially popular use of GIS is in applications for state parks (16 states), including activities such as tracking recreation uses and construction. States also use GIS for applications on special land resources such as arctic areas, beaches, deserts, prairies, sand dunes, shrub-steppes, and sensitive areas.

Other widespread applications include wildlife management, with 39 states using GIS for this purpose. Some of the most frequent uses are for endangered species (17 states) and wildlife habitats (31 states). Game species management is another widespread application.

At least 10 states are beginning to use GIS for air resource management applications, including radon and ozone mapping, acid rain analysis, and for identifying, monitoring and tracking sources of air emissions.

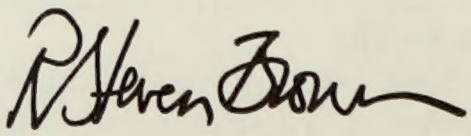
Waste management applications also are used frequently, with hazardous waste disposal site locations (seven states), spills (13 states), and superfund site management (seven states) among the most common.

By far the most common use of GIS is for water resource management. All 50 states either have or are planning at least one water-related GIS application. It is common to use GIS for groundwater applications, with contamination mapping, vulnerable areas, water wells, and aquifer protection the most frequent. Uses for bays and coastal resource management for both quality and productivity are also quite common. Surface water applications are also growing. At least 16 states use GIS for non-point source management, and 10 states for drinking water concerns. Seventeen states use GIS to help them with their underground storage tank programs. At least 31 states are using GIS in their wetlands programs.

The authors expect that GIS programs, along with other information technologies, will continue to grow throughout the 1990s. Moreover, we expect the trend of increased coordination among different agencies and levels of government to continue. In some cases, such coordination may be required to prevent even the perception of duplication of effort.

In view of the recent cutbacks in state budgets, it is difficult to predict continued growth of GIS applications. However, there are a great number of possibilities left for states to consider should funding become available. Environmental applications already are among the most prevalent; however, even the most common are usually found in fewer than 30 states. Some innovative new programs for environmental administrative data management and planning show promise, such as those for integrated environmental data management.

There also is potential for beginning or expanding GIS in other state agencies. We have noted that economic development and public assistance agencies seem to be reasonable candidates. Health agencies, we believe, are likely to use GIS for disease tracking, such as cancer incidence. Increased use among public utility regulators also may occur. Finally, we expect to see more innovative and unique applications designed to help make state government programs more responsive and to improve the management of the resources allocated to them.



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Guide to Use of the Compendium

The *Compendium* is organized around three primary components: the State Profiles; the Tables; and the Directory of State Officials. Most of the material used in these sections was collected in 1991, but the effort to produce this book began in 1990, and material from earlier periods was used where appropriate.

The book's focus is on the use and management of geographic information and geographic information systems in state governments. In addition, "GIS," as used herein, includes related technologies such as global positioning systems (GPS), and other geographic information such as remote sensing (including satellite imagery and aerial photography) and manual mapping when possible.

State Profiles

The format for the State Profiles is a compromise between our recognition that the states' GIS programs are different and our need to compare them methodically. Each State Profile contains a series of sections, each of which was written to stand alone. This design accommodates persons who are interested in focusing on a specific aspect of a state effort, without having to read the entire Profile. Persons who read the entire Profile will therefore note intentional redundancies.

The *Compendium's* "State Profiles" are organized under three broad categories (described below), preceded by an overview paragraph, and followed by an annotated bibliography of state documents and occasional excerpts from key documents. The profiles are current as of mid to late 1991. To the extent possible, at least one person from each state was allowed a final edit of the material contained in the profiles. Any errors, however, are the responsibility of the authors.

Origins of State Initiatives

This section provides a chronological review of the history of each state's geographic information and GIS activities through the end of 1989. Many early GIS efforts, like those today, were dependent on the foresight and forbearance of individual public servants. Although the *Compendium* does not provide special recognition of these individuals' contributions, readers should be aware that the genesis of many of the geographic information initiatives in the states are the result of their dedication and determination. Those interested in learning more about these GIS "pioneers" are encouraged to contact the principal author.

Coordination Efforts, Groups and Activities

The focus of this section is on statewide initiatives, directives and activities influencing geographic information development and coordination. It includes a summary of information the states provided in their responses to The Council of State Governments' national survey, conducted in 1990-1991. It is supplemented by an extensive review of documents provided by states (many of which are included in the annotated bibliography for each state) and discussions with between two and 12 state officials per state.

The section includes statutory and executive directives, memoranda of understanding, interagency projects, and other coordination activities. Key entities in these efforts, particularly interagency and other interorganizational statewide groups in each state, are described. For some states, special subsections address frequently mentioned areas of interest. As applicable, these sections include "Policies and Standards," "Regional and Local Government Programs and Assistance," and "Federal Relations."

GIS in State Government

This section reviews GIS activities in individual state agencies. The agency reports are generally listed in a similar order for each state. As applicable, the order is central information technology office or offices first, followed by the central or largest agency with GIS activities, and functional agencies, including natural resources and environmental agencies, human services and community planning agencies, utility regulatory commissions, transportation agencies, legislative branch offices, and academic institutions. Agency reports vary from a few lines to a few pages.

As possible, each agency report is presented in the following order: institutional conditions and approaches, financial and personnel resource commitments, GIS or related technology utilized, and data and applications. Efforts to determine resource commitments were difficult, largely due to differences in definitions. Financial commitments were particularly difficult, as each state has a different manner of recording expenditures. State officials using GIS are not necessarily able to describe full costs, and GIS costs are often accounted for within other program efforts. Although similar difficulties occurred with personnel information, these figures are more precise. Technology in use is generally described, as are data development and applications activities.

The agency reports identify issues and problems being addressed by state agencies using GIS. To help readers access information about applications, projects are described under the most appropriate agency according to its mission, rather than with centralized service bureaus that sometimes conduct work for other agencies.

Annotated Bibliography

Over 400 state directives are included in the *Compendium*, such as legislation and executive orders; legislative reports; memoranda of agreement and understanding; plans; policies; standards; reports; catalogues; requests for proposals; papers; articles; and newsletters. The number of annotated documents varies by state from none to over 20. In states with numerous materials, documents generally are presented with the most recent documents first, followed by older materials. Documents Excerpts. Some of the annotated documents were chosen to be presented in full in the *Compendium*. Criteria for inclusion in this section were that the chosen document be unique, exemplary, short enough to be included verbatim, and represent potential models for other governments. These documents are similar to those which have been abstracted; however, they particularly include legal instruments, such as executive orders and memoranda of agreement and understanding.

Tables

Tabular information is drawn largely from CSG's national survey, completed for each state by coordinators designated by the Governors' offices during the early phases of the project. Much of the information from these surveys was incorporated directly into the State Profiles in lieu of tables.

Directory

The state-by-state directory of geographic information and GIS contacts includes about 20 categories of state officials for each state. Persons wishing additional information about any item in the State Profile should turn to the appropriate Directory category for that state. For example, users wishing additional information about a state forestry application should turn to the forestry category for that state in the Directory. General information about a state's GIS activities might best be answered by the designated Coordinator, usually the first person listed in each state.

This directory is available on disk. Please see page 603 of this document for additional information.

Index

The *Compendium's* index includes entries for the GIS applications used in the states. The user will note that we have referenced material by two-letter state abbreviations instead of by page number. Usually a description of an application can be found in a State Profile under the section entitled "GIS in State Government."